PRESIDENT OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT
JOIN THE REVOLUTION PROGRAM
FORM FOUR PRE-NECTA I (2023)
PHYSICS MARKING GUIDE

1.

i	ii	iii	iv	v	vi	vii	viii	ix	x
B	C	A	A	B	A	A	C	B	D

10 Marks @ =1

2.

i	ii	iii	iv	v	vi
A	B	C	D	E	J

6 marks @ = 1

3. a) Vc = 60 cos 60

  = 60 x 0.5

  = 30N **04 marks**

b) The nail is not driven into the wood

  Thus

  Vc = 60 cos 90^0 **06 marks**

  = 0

4. a) i) The boots for soccer and hockey player have studs on their soles this is to avoid slipping during playing. This is because the studs decrease the area of contact between the feet of the player and the ground. As a result, pressure of the feet on the ground increase and the player can run about the ground without slipping.

  ii) The force required by man to move his limbs immersed in water is smaller than the force for the same movement in air this is because the upthrust (buoyancy force)

on a body is much more in water than that when immersed in air. Therefore, the effective of the limbs of a man is less in water than in air. For this reason, the force required to move his limbs in water is much smaller than the force for the same movements in air.

b) i) Diameter of the base of conical flask (d) = 7.0cm = r 3.5cm = 0.035m

The depth of the liquid (h) = 10cm = 0.1m

Density of the liquid (ρ_l) = 840kg/m^3

Force due to liquid (F) = unknown

Solution

From the formula of force

$F = mg$------------(i)

But from density

$m = \rho V$-------------(ii)

Where

m = mass of the liquid

ρ = Density of the liquid

V = Volume of the liquid

Then

$V = Ah = \pi^2 h$-----------(iii)

Substitute equation (ii) and (iii) to equation (i)

ii) Data given

Cross section area = A

Force = F

Height = H

Density = ρ

Required the pressure of liquid = P

Solution

Pressure $(P) = \frac{force(F)}{Area(A)}$

$$P = \frac{F}{A} \text{-----------(i)}$$

But

$$F = mg \text{------------- (ii)}$$

Then

$$F = \rho\pi hgr^2$$

$$F = 840kg/m^3 \times 3.14 \times 0.1m$$

$$\times 9.8m/s^2$$

$$\times (0.035m)^2$$

$$F = 3.1664N \approx 3.17N$$

Find the total force due to the liquid on the base in Newton's 3.17N

$$m = \rho V \text{----------(iii)}$$

Also

$$V = Ah \text{--------------(iv)}$$

Substitute equation (ii), (iii) and (iv) to equation (i)

$$P = \frac{\rho Ahg}{A}$$

$$P = \rho hg$$

The pressure P exerted by the liquid on the bottom of the cylinder is given

as P= ρhg

Hence driven!!!

5.   a) i) According to newton's second law of motion,

Force (F) $\frac{Mass\ (m) \times change\ in\ velocity\ \Delta V}{time\ taken\ (t)}$ **1 mark**

Thereby, a person failing on a cemented floor gets more hurt than a person

failing on a sand floor, because on failing on a sand floor, the time of impact

increase due to depression of sands and this cause a decrease in impulsive force

and hence less hurt **2 marks**

ii) According to newton's third law of motion, for every action, there is an equal but

opposite reaction

Thereby, the hunter moves abruptly backwards because of the reaction force

which is equal but opposite to the action force of the bullet during firing
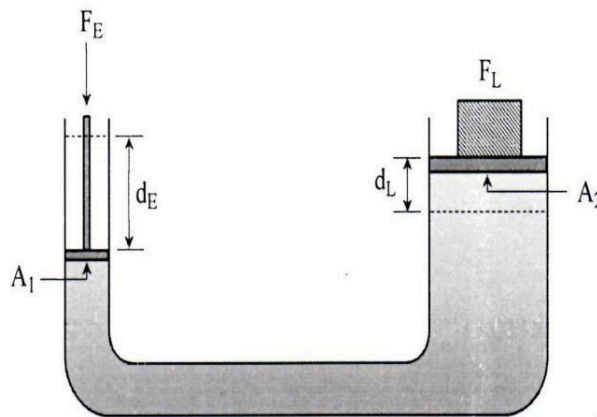
$$1\frac{1}{2}\ marks$$

b) Data given Efficiency of hydraulic press, $e = 90\%$

Diameter of a large cylinder is eight times the diameter of a small cylinder,

$D_2 = 8D_1$.

Required: Mechanical advantage of hydraulic press, MA

Solution

Here, a student is required to draw a well labelled cross-sectional diagram of a hydraulic press as shown below

Also, a student is required to express the relationship between the cross sectional area of the cylinder and the distance by which it is moved in order to find velocity ratio of the machine.

From the figure, it is clearly that the cross - sectional area of each cylinder is inversely proportional to the distance by which it is moved. That is,

$$A_1 \propto \frac{1}{d_E}$$

$$A_1 = \frac{K}{d_E}$$

$$K = A_1\ {}^d E$$

$$A_2 \propto \frac{1}{d_L}$$

$$A_2 = \frac{K}{d_L}$$

$$K = A_2\ {}^d L$$

Where K = Volume of liquid displaced by either cylinders of the hydraulic press.

This means that, $\quad\quad$ **A$_1$ ^dE = A$_2$ ^dL**

Rearranging it, we have

$$\frac{d_E}{d_L} = \frac{A^2}{A^1}$$

$$\frac{d_E}{d_L} = \frac{\pi\frac{D2^2}{4}}{\pi\frac{D1^2}{4}}$$

$$\frac{d_E}{d_L} = \frac{D2}{D1^2}^2$$

Recall that D$_2$ = 8D$_1$. Thus,

$$\frac{d_E}{d_L} = \frac{(8D_1)2}{D1^2}$$

$$\frac{d_E}{d_L} = \frac{64D_1{}^2}{D_1{}^2}$$

$$\frac{d_E}{d_L} = 64$$

Since V.r = $\frac{d_E}{d_L}$, Then

$$V.R = 64 \quad\quad\quad \text{½ mark}$$

$$e = \frac{M.A}{V.R} \times 100\% \quad\quad \text{½ mark}$$

e x V.R = M.A X 100%

M.A = $\frac{e \times V.R}{100\%}$

M.A = $\frac{90\% \times 64}{100\%}$

M.A = 57.6 $\quad\quad\quad\quad$ 1 mark

The mechanical advantage of hydraulic press is 57.6

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ **Total 9 marks**

6. $\quad$ a) Use Newton's second law of motion to deduce that, impulse is equal to the change of linear momentum of a body, and explain why it necessary

important to fold our legs when we jump from a height on landing

5 marks

Expected response

From Newton's second law

The force applied F is proportional to the rate of change of linear momentum $\frac{\Delta P}{\Delta t}$

Then mathematically,

$$F \ a \ \frac{\Delta P}{\Delta t}$$

$$F = K \frac{\Delta P}{\Delta t}$$

Where k = 1 = proportionality constant

$$F = \frac{\Delta P}{\Delta t}$$

$$F\Delta t = \Delta p$$

But FΔt = impulse

Impulse = Δp

It is necessary to fold the legs when jumping from a height on landing in order to extend time of impact of force (increase impulse) in order to reduce pain.

b) A car with cambered wheels cannot overturn instead it will only skids because the cambered wheels make it very stable. **4 marks**

7.   a) Heat capacity is the amount of heat required to raise a temperature of a body by one kelvin WHILE Specific heat capacity is the amount of heat required to raise unit mass of a substance by one kelvin   **2 marks**

b) $\theta_1 - \theta f = \theta f - \theta_2$

$\theta f + \theta f = \theta_1 + \theta_2$

$$\frac{2\theta f}{2} = \frac{\theta_{1+\theta_2}}{2} \qquad \textbf{1 mark}$$

$$\theta f = \frac{(25+35)^{0}_{c}}{2} \qquad \textbf{1mark}$$

$$= \frac{60^{0}_{c}}{2}$$

$$\theta f = 30^0C$$

The equilibrium temperature = 30^0C **2 marks**

8.   b) i) An object appears coloured when light falls onto it because the object

reflects light of its colour falling onto it, and it absorbs the rest.   **2 marks**

ii) Pigment are impure while light is pure. A yellow pigment absorbs blue light and

reflects yellow red and green and a blue pigment absorbs yellow and red

lights and reflect blue and green. When the two are mixed only green light will

be reflected in common blue light and yellow light are complementary colour

they add to white.

<div align="center">

5 marks

</div>

9.   a) The effects of x-rays to human being are

         ☐   Destroy cells and can cause cancer

         ☐   Can cause mutation due to destroy of genitals

<div align="center">

$1\frac{1}{2}$ @ = **3 marks**

</div>

b) i) X-rays are produced when filament or a cathode which emits fast moving

electrons into a vacuum accelerates from cathode to strike a target with an

anode which some of kinetic energy converted to x-rays
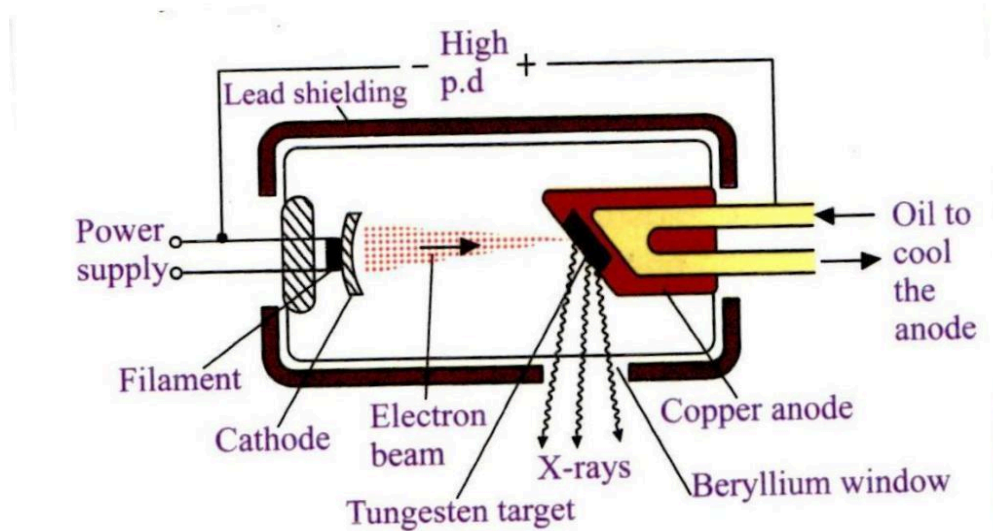
ii) Use of x-ray in daily life are;

- ☐ In medical field soft x-rays, used to defect to broken or fractured bones or some disease in soft tissue and treatment of cancer

- ☐ Crystallography: experiment study of the arrangement of atom in solid (study of arrangement of crystals)

- ☐ Astronomy: x-ray emitted by celestial objects are used observational astronomy

- ☐ x-ray microscopic analysis: involves the use of electromagnetic radiation in the soft x – ray band to produce image of very small object

1 @ 4 marks

10.   a) Faraday's law of electromagnetic states that

''Whenever there is change in magnetic flux linked with a closed circuit e.m.f induced whose magnitude is directly proportional to the rate of change of the magnetic flux linking the conductor''   **2.5 marks**

Lenz's law states that

''The direction of induced e.m.f is such that the resulting induced current flows in such a direction that oppose the change that cause it''   **2 marks**

b)

	Name 1 mark @	Reason 1.5 mark @	Function 1.5 mark @
i	Step down transformer	Has low number of turns in secondary coil	To step down electricity before used in houses
ii	Step up transformer	Has high number of turns in secondary coil	To step up (increase) electricity from power ststion

11. a) The diagram of cathode ray tube

Cathode ray tube used in

- ☐ Computer display
- ☐ Television   **any two 1 mark @**
- ☐ Cathode – ray oscilloscope (CRO)

Properties of cathode rays

- ☐ They travel in straight lines
- ☐ They carry negative charges
- ☐ They have energy and momentum
- ☐ they affect photographic plates   **any two 1 mark @**

b)

Device	Purpose
Diode	To allows current to flow through it in one direction

Transistor	To amplify or switch electronic signals and electrical power

2 marks @

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PHYSICS SERIES

WhatsApp 0624 254 757